

## SIDEBAR

**Disruptions and Breakthroughs in S&E during the COVID-19 Pandemic**

The COVID-19 pandemic was a disruptive event for the entire world.\* In the United States, unemployment rose sharply, and educational setbacks occurred across all levels of instruction. Populations historically underrepresented in S&E and low-income households suffered the most severe impacts, both in terms of job security and education. Yet, the pandemic showed the power of the S&E enterprise to address urgent global needs, with the United States collaborating extensively with other nations to collectively study the virus and develop effective vaccines.

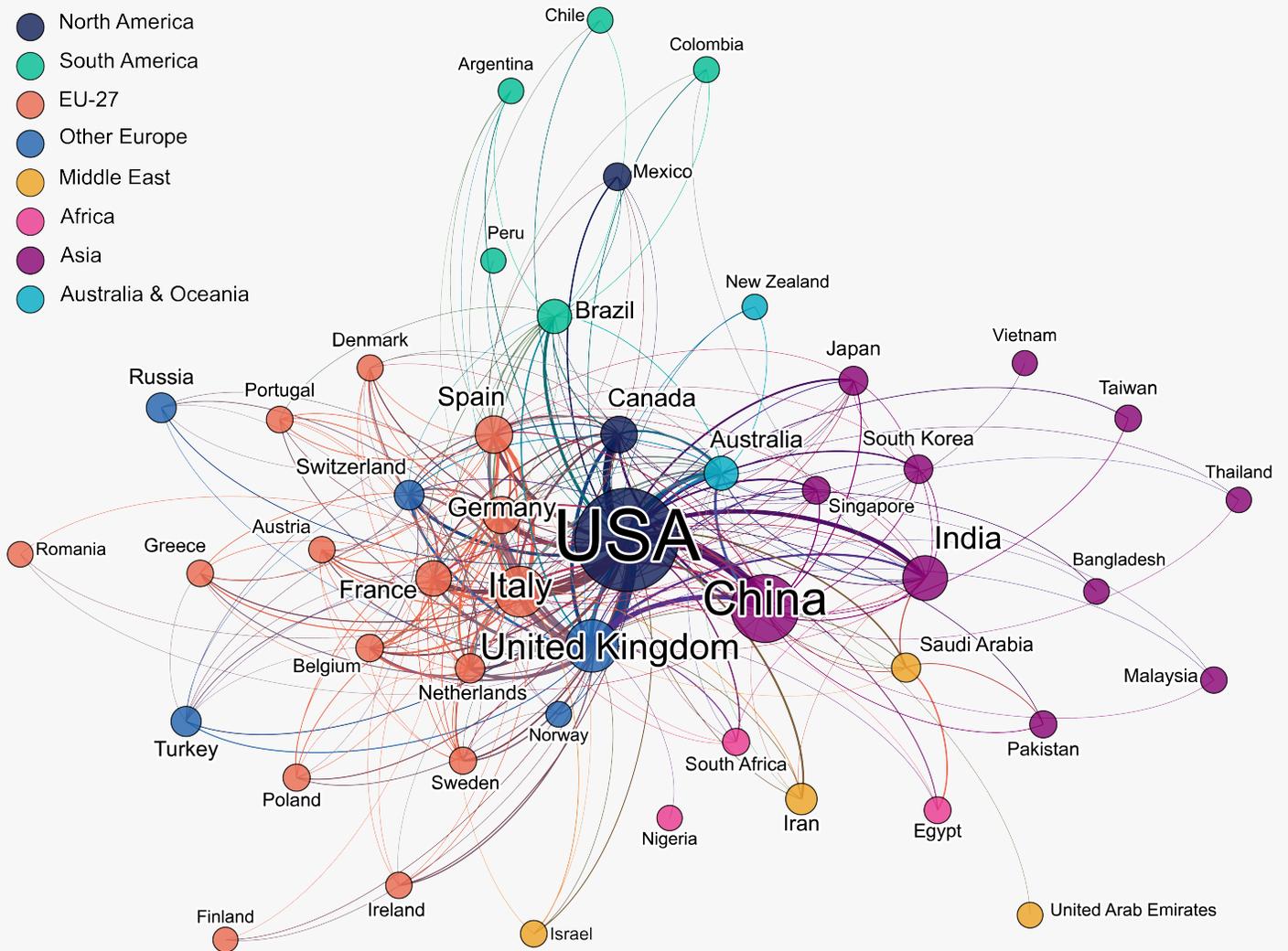
Science, technology, engineering, and mathematics (STEM) workers experienced lower unemployment rates than non-STEM workers during the pandemic. With businesses closed and many people socially distancing at home, STEM unemployment jumped from about 3% in March 2020 to 9% in April 2020—but for those in non-STEM occupations, unemployment shot up from about 5% to 16% during the same period. By September 2020, while still higher than before the pandemic, unemployment had declined for both STEM and non-STEM workers. STEM workers without a bachelor's degree and non-STEM workers with a bachelor's degree reached equivalent unemployment levels (about 6% each).

The abrupt transition to online learning in most K–12 districts and postsecondary institutions in the spring of 2020 created major challenges for both teachers and students. Sociodemographic differences among students at all levels were exacerbated. Access to computers with stable Internet connectivity varied greatly by race or ethnicity and income level. At the undergraduate level, larger proportions of Blacks, Hispanics, and American Indian or Alaska Natives than Whites reported that they lacked access to the technology required for online learning (Soria et al. 2020). For K–12 students, studies estimate that some students lost up to a full year of math learning. Enrollment declined sharply at community colleges that serve low-income students (down 10% in the fall of 2020), threatening students' educational aspirations, the financial viability of these schools, and the continued development of the skilled technical workforce (STW).

While the entire world struggled under the economic, educational, and societal implications of the pandemic, the strength and resiliency of the U.S. S&E base provided the springboard upon which vaccines were developed and made available in record time. The U.S. federal government, universities, pharmaceutical and other private companies, and nonprofit organizations intensively partnered to develop, test, produce, and begin to distribute effective vaccines within 1 year from the release of the first DNA sequence of the coronavirus that causes COVID-19. This extremely rapid success resulted from many years of research in coronaviruses and the molecular biology of DNA and RNA, as well as technological advances in DNA sequencing.

More broadly, the pandemic revealed the collaborative nature of the global S&E enterprise. Coronavirus-related published research reveals extensive international collaboration networks and the central role of the United States (Figure A). The network analysis shows the centrality of the major research countries—United States, China, the United Kingdom, European Union (EU)-27 countries, and Japan. Other countries, such as Iran and Russia, are less integrated into the network. The diagram also shows strong collaboration between the United States and authors in China, the UK, and Canada.

Figure A

**Collaboration network on coronavirus-related articles, by country: 2020****Note(s):**

In the network diagram, the color indicates region; node size is proportional to the total number of coronavirus-related articles written by each country, the thickness of the links between nodes is proportional to the quantity of co-written papers, and the distance between nodes indicates the relatedness (similarity in terms of network properties) of the countries (Jacomy et al. 2014). Data for the diagram were pulled from the 50 countries that produced the most coronavirus-related research and also cowrote 50 articles or more, using whole counting. Coronavirus article counts refer to publications from a selection of conference proceedings and peer-reviewed journals in S&E fields from Scopus. Articles are classified by their year of publication and are assigned to a country on the basis of the institutional address(es) of the author(s) listed in the article. Links are only shown in a single direction, dictated by alphabetical order.

**Source(s):**

NCSES, special tabulations (2021) by SRI International and Science-Metrix of Elsevier's Scopus abstract and citation database.

*Indicators 2022: Publications Output*

The experience of the pandemic highlights the inequities in both U.S. STEM education and the U.S. STEM workforce, while simultaneously showing the need for a strong and resilient S&E enterprise able to rapidly meet urgent global crises. Amidst the disruptions and breakthroughs due to the pandemic, the public's overall trust in science and how the media portrayed COVID-19 research appeared to influence U.S. public support for COVID-19 science. In January

2021, a national U.S. survey by the U.S. Census Bureau found among Americans who had not been vaccinated 22% said they would not or definitely would not get a COVID-19 vaccine; in that group, about one-third cited a lack of trust in the COVID-19 vaccines or in the government as considerations for the decision.

\* This sidebar draws on data and sources from the *Indicators 2022* thematic reports.